User's Guide

to BubbleBead™ Filters

Models XS-1, XS-2, XS-4

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Note: U.S. Equivalent Model Numbers are as follows -
XS1 = XS2000; XS2 = XS4000; XS4 = XS8000

Your New BubbleBead™ Filter

Congratulations on the purchase of your new filter.

GREAT WATER QUALITY

BubbleBead filters are ideally suited to koi ponds, ornamental fish tanks, fish holding systems and aquaculture facilities. They give excellent water clarity whilst at the same time working as an efficient biological filter, breaking down fish wastes. A correctly sized unit can achieve this clean and clear water quality on its own, or it can be used in conjunction with other filter equipment.

EASY CLEANING

The BubbleBead's major advantage is the ease with which it can be cleaned. On the XS models this simply involves turning one valve to start the patented backwash process.... no wet hands! Trapped dirt is flushed to waste. By carrying out this backwash regularly, fish wastes can be removed from the system before they have fully broken down. This greatly reduces the nutrient loading on your system and further improves water quality for the fish.

ADAPTABLE AND VERSATILE

Use the unit as a standalone filter, or use it to boost an existing filter system. Fit the XS filter near your existing pond, or at a distance. Site it below the pond or above the pond. Hide it behind a bush or fence, or even in a shed or garage. The unit takes up a fraction of the space of some other types of filter, and no labour intensive excavation is necessary to site it.

EASY TO FIT AND USE

The XS range of BubbleBead filters are the easiest yet to fit and use. But as with any equipment, the filter will function at its best if it is fitted and maintained correctly. Please take a short while to look through this guide before you get going, so that you can get the very best from your new filter system.

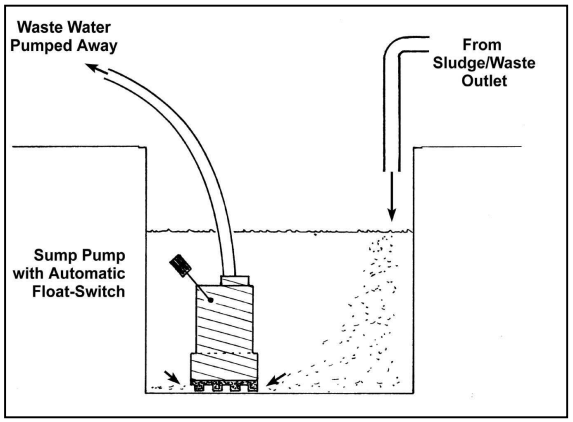
Siting the filter

Before you start to assemble your filter, think carefully about where it is to be sited. Choosing the wrong site may cause the filter to function less well or make it awkward to carry out maintenance in the future. The filter can be some distance from the pond, but a more powerful pump may be required to overcome the friction loss in the longer pipework.

CHOOSE A SITE CLOSE TO A DRAIN FOR THE WASTE WATER

When you clean the filter, dirty water flows from waste outlet. In most cases this water can be piped to a convenient nearby drain. As it is nutrient rich, the waste water can also be used for irrigation in gardens (provided that treatments and salt have not been used in the pond).

The drain or sump area must be below the filter's waste outlet. If this is not possible, either the filter can be raised up higher, or a sump tank can be sited below the filter and an automatic sump pump can pump the waste water away. In some cases it is possible to plumb the filter waste outlet directly to a pump, to pump water from the filter.

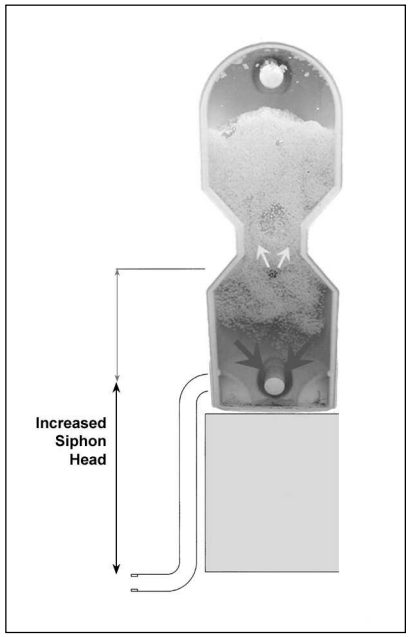


Using a separate sump and sump pump to dispose of waste water.

This is an ideal option for sites set below local drainage, or where waste water is to be pumped to irrigation pipes.

For the bead media to be cleaned vigorously, waste water needs to drain **rapidly** and forcefully from the waste outlet. This is simply achieved by using suitably large bore hose and ensuring that there is some **siphon head** to help pull water from the filter. At the same time, this sucks air into the filter to help clean the bead media.

THE SIPHON HEAD



The siphon head (see diagram) is the distance between the filter waste outlet and the air strainer inlet to the filter.

This distance is over 30 cm on the filters as supplied, which is adequate in most circumstances. However, by simply raising the filter on a plinth (built from one or two courses of standard building blocks topped with a paving slab) and adding an extension pipe, the siphon head is increased and the efficiency of backwash **greatly improved**.

We recommend that this increased siphon head be created wherever possible.

FIRM BASE

The filter needs to be mounted on a firm level base. The units are heavy when full of water and **must** be adequately supported for safety. Position the filter on a level, purpose made slabbed area or concrete plinth.

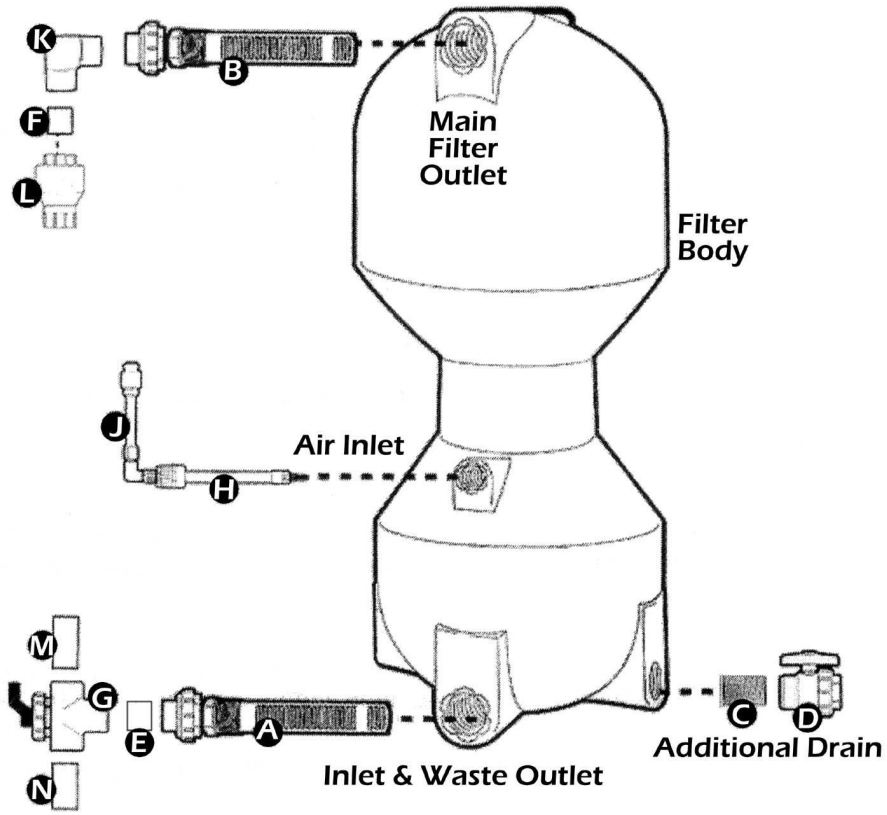
FUTURE ACCESS

It is necessary to access the three way control valve on a regular basis. The fittings at the base and top of the filter should also be readily accessible and **not** permanently boxed in.

OUTSIDE OR UNDER COVER?

The filters are suited to outdoor use but if sited in an outhouse, shed or garage, they will not only be out of sight from the pond but also better protected from severe frosts (see the Winter Running section – page 25).

Assembling your BubbleBead Filter



Check that you have all the relevant parts before commencing:

● Main filter body ● Bead media (not pictured) ● PTFE Tape (not pictured)

A & B	Inlet & Outlet Screens with unions	**K**	Male/Female Elbow
C & D	1½" Close Nipple and Ballvalve	**L**	CheckValve
E & F	Short length of PVC pipe*	**M & N**	Inlet/Waste Fittings (vary according to pack)
G	Three Way Valve		
H	Air Inlet Pipe and Screen		
J	Air Inlet Checkvalve		

*1½"dia. on XS-1 & XS-2; 2"on XS-4

You will also need some PVC glue, and any interconnecting pipe & fittings.

ASSEMBLY STAGES

Check that any shards of plastic and packing debris are brushed out of the filter body and threads. All threaded plumbing fittings **must** be wrapped with several winds of the PTFE plumbers' tape to ensure that the joints are fully watertight and to simplify any future disassembly.

◂ 1) Wind tape onto the inlet screen (**A**). Note the direction that the tape is wound on. If it is wound on the wrong way, it will tend to peel off as the fitting is screwed in. When using standard thin PTFE tape we recommend at least **five** layers of tape be wound on for a really watertight seal. (To reduce the risk of 'salt creep' on marine systems, use aquarium silicone sealant, spread on the female threads just before the fitting is inserted)

▸ 2) Insert the fitting into the base of the filter. The screen has a tight fit through the pre-cut hole in the filter body.

To avoid cross threading, turn the fitting anti-clockwise a half turn or so until the threads click into place, then screw clockwise. Tighten firmly by hand using the knurled section closest to the filter body.

◂ 3) Wrap one half of the close nipple fitting (**C**) with tape and thread it into the additional drain (marked with the 'Caution' sign).

▸ 4) Wrap tape clockwise round the exposed end of the close nipple fitting.

◂ 5) Fit the ballvalve (**D**) to the nipple. Tighten it by hand and leave the handle facing upwards.

▸ 6) Wrap the threads on the air inlet fitting (**H**) and insert it, screen first, into the centre hole on the filter body. Hand tighten. Wrap the exposed thread clockwise with PTFE tape.

Although the filter could be filled with beads at this stage, we strongly recommend a test run **without** beads. If the test run points out leaks in the system, any pipework modifications will be much easier to carry out whilst the filter has no beads in it.

▸ 7) Fit the Outlet Screen (**B**).

It may be easiest to move the filter to its final position at this stage. This may require assistance - especially on the larger models!

◂ 8) Fit the air inlet checkvalve (**J**) ensuring that PTFE tape is used on **both** threads of the elbow.

Hand tighten and leave the checkvalve pointing upwards, as shown.

▸ Both the inlet and outlet fittings require the use of PVC pipe glue and a short length of PVC pipe. Ensure that the fittings and pipe are free of burs, clean, grease-free and dry. Attempt a dry fit before using glue. Give the glue sufficient time to set !

◂ 9) Firmly hand tighten the union on the inlet. Fit the three-way valve* (**G**) as shown, using a short length of pipe (**E**) and glue. Check that the valve is fitted to give lever movement from 9 o'clock to 3 o'clock (and not 3 to 9).

▸ 10) Firmly hand tighten the union on the outlet. Fit the outlet checkvalve (**L**) using one of the short lengths of supplied pipe (**F**), the male/female elbow (**K**), and glue.

The checkvalve flap should open **away** from the filter, and the 'Horizontal Use This Side Up' label should be facing **uppermost**.

*(N.B. If you plan to use an actuated ball valve see p.38)

It is not critical which way round you fit the elbow, but the checkvalve fitting **is** critical. The fittings will need support whilst the glue sets.

Siting

If the filter has not already been moved to its final site you should do so now. Larger filters are heavy, do not attempt to move them without extra assistance. Do not carry the filter using the protruding fittings, otherwise damage could occur.

As suggested (pages 4 & 5), the filter should be on a firm level base and raised if necessary. Place an offcut of rubber liner or close-cell foam under the filter to support the filter base snugly and take up any unevenness.

Ensure that sufficient space is left to gain access to the valves and fittings, especially at this stage as the beads have yet to be added. You may also wish to pull out the inlet/outlet strainers at some stage in the future, and these require clearance (e.g. 30cm on the XS-1).

Plumbing in

The socket in the outlet checkvalve on the filter can be plumbed using solvent weld fittings or adapted to flexible hose (as shown). Your stockist can supply fittings to convert all inlet/outlets to use with flexible hose.

The inlet and waste outlet on the three-way valve can be fitted with either solvent weld pressure pipe or adapted to flexible hose.

For ease of future maintenance, fit dismountable unions (or 'nut-and-liner' female hosetails) close to the filter. All pipework **must** be fully supported so that it does **not** put undue strain on the filter fittings.

It is entirely up to you, which way round the inlet and waste outlet are plumbed on the three-way valve XS models. This will usually depend on the direction to the nearest drain.

WASTE OUTLET PIPEWORK

It is particularly important to avoid restricting flow from the waste outlet. Avoid using excessive numbers of bends and use the largest practical bore of pipework. Some users install a sight-glass in the waste pipework so that they can easily see how much dirt there is in the waste water.

The very final section of pipe, whether a vertical or horizontal drop, can use slightly smaller pipe (e.g. 40/42mm i.d. reducing to 38mm. If you are using hose, insert a short length of slightly smaller diameter hose inside the pipe end). This slight restriction ensures that when the filter is drained, the entire pipe fills with water, driving out air and starting a siphon action, which helps to suck dirt from the filter. A relatively long horizontal outlet in solid pipe encourages this siphon action and is an ideal alternative where raising the filter is not feasible. Avoid excessive lengths of undulating hose as this can encourage airlocks. Rapid draining of water from the waste outlet is essential for an efficient filter backwash.

DISTANCE FROM THE POND AND FROM YOUR DRAINS

The filter can be some distance from the pond, but a more powerful pump may be required to overcome the friction loss in the longer pipework. The filter should ideally be relatively close to your drainage system or soak-away for ease of waste water disposal. If this is not possible, see the option shown on page 4.

Dealing with waste water

Waste water leaves the filter at a rapid rate. Check that your drains or soakaway can cope with this surge. Waste water is often high in solids and organic waste and must not be emptied directly into natural water bodies. You may need permission to direct this waste into public sewers.

Plumbing tips:

• To minimise pressure loss on the inlet and backpressure on the outlets:

- use larger bore pipe/hose wherever an option is possible
- all pipe fittings (including UVs) must be as large bore as possible
- avoid multiple fittings with internal restrictions
- avoid using valves on the top filter outlet! (see Appendix Five)
- consider swept rather than knuckle bends and keep bends to a minimum
- flexible hose should be heavy duty, crushproof, opaque, smooth bore, and suited to the pressures likely to be found in the system.

• To prevent strain on the filter inlet/outlet fittings:

- **support pipework** with pipe-clips etc., it is heavy when full of water!
- **avoid the weight of pumps or external UVs being carried by the inlet/outlet fittings.** Failure to do so, could void your guarantee.

• To prevent leaks of water out, or air in:

- use PTFE plumbers tape on **all** threaded fittings
- use solvent cleaner on any solvent-weld fittings before use and use ample amounts of an appropriate glue. Set up solvent fittings in a 'dry run' to check positionings **before** final gluing takes place. Glue needs time to set!
- use correctly sized hosetails and appropriate hose clips. If the hose is slightly loose on the hosetail, run a strip of silicone sealant (or 'Innotec' Adheseal) around the hosetail before fitting the hose and clamping down.

Clips can distort hose causing leaks if over-tightened.
TIP: To reduce this risk, wrap the end of the hose with a single layer strip of rubber liner before fitting the clip.

• To prevent excess pump vibration reaching the filter:

- use flexible hose in the outlet pipework from surface mounted pumps.

• To avoid corrosion or poisoning problems:

- avoid metal fittings
- if metal parts are used, choose quality materials e.g. (316) stainless steel. (The threads on the XS ports are marine grade aluminium.)

Choosing the correct size of pump

Pump size is related both to the volume it pumps **and** the pressure with which it pumps. The maximum pump flows to aim for are listed on the table on page 15, though it is possible to run the filter at lower flow rates when used on smaller systems, or if 'ticking over' during winter months. For best results the filter should not be run at less than 30% of the rated maximum flow. This flow is required to supply the filter organisms with the necessary oxygenated water for efficient filtration.

THE MINIMUM HEAD:

There is some loss of pressure across the bead bed, especially as the filter approaches the time for backwash. Although pumps with a relatively low maximum head (2 metres) may be powerful enough to completely fill the filter when the pump is first switched on, there is a risk with such pumps of 'underpressure' (see page 16), which leads to poor filter performance. To avoid this we recommend using pumps with a rated head of at least 4.0/4.5 metres (13/14 feet) or at least 2 metres more than the 'working head' of the pump (see the table overleaf). The working head is the vertical distance between the water level in the originating pond/tank, and the highest point in the filter/pipework loop that returns to the pond. Flow rates should be calculated at the pump's working head, not the maximum pump flows quoted by some manufacturers, which are taken at zero head!

MAXIMUM PRESSURES:

The filter hull itself has a maximum pressure rating. On the XS models this rating is 0.7 bar (10 psi) equivalent to a head of 7 metres, and it should never be exceeded. If you are using a high pressure or swimming pool pump with a quoted head exceeding 7 metres we consider it **essential** to use a bypass tee before the filter inlet, with an appropriate pressure regulating spring-check-valve of at least 1.5" bore to prevent excess pressures building on the filter. (see Appendix Five). N.B. Even with a bypass fitted, the pump used must have a head not exceeding 10 metres. A pressure gauge is also very useful in such situations.

Some swimming pool pumps are not designed to be run at low pressures or low heads. As the pressure through a BubbleBead filter may drop as low as 0.15 – 0.20 bar (2-3 psi / 1.5 - 2.0 metre head equivalent) only use pumps whose recommended range drops this low.

WHICH PUMP?

The table below notes the maximum filter flow rates and the volumes that might be filtered at a two or three hour turnover rate. On heavily stocked commercial systems the required turnover rate might be once or more per hour, and the volume treated would need to be reduced accordingly.

Your dealer should be able to recommend suitable pump models from the brands available in your area, also see our website. Remember that a small pump may not suit longer pipe runs or high head situations. If in doubt, it is better to have a slightly larger pump and use a valve on the pump, or a bypass to control excess flow, rather than to have a small pump with no spare capacity. Surface mounted pumps should be of the self-priming type or installed in a way that ensures they cannot run dry.

Model Model number refers to cubic feet of media	**Max. Feed Rate per day** (Max. Koi load @1% feed rate)	**Max. Rec. FlowRate gph** *(lpm)*	**Maximum Pond Volume Gallons** *(Litres)* at maximum rec. flow rates 2 hour - turnover - 3 hour Standard Stock	Light Stock	**Suggested Pump Size** Pre-straining or pre-settlement is **essential** when using solids handling pumps	Recommended **UV** for algae control at standard stock volume in full sun #
BBF-XS1 1.08m high 0.41m dia. 45L backwash	**0.5 lbs.** *230 gm* (23 Kg)	**800** *60*	**1,600** *7,250*	**2,400** *11,000*	Maximum head of the pump should be at least 2.0 metres more than the working head or exceed 4.0 metres whichever is the higher figure	**25 - 30w** or 2 x 11w PL
BBF-XS2 1.25m high 0.50m dia. 95L backwash	**1.0 lbs.** *450 gm* (45 Kg)	**1,500** *115*	**3,000** *13,500*	**4,500** *20,000*		**30 - 55w** or 3 x 11w PL
BBF-XS4 1.53m high 0.66m dia. 170L backwash	**2.0 lbs.** *900 gm* (90 Kg)	**3,250** *245*	**6,500** *29,000*	**9,750** *44,000*		**2 x 55w** or 2 x 30w or 2 x 36w PL

N.B. A pressure release bypass is essential if using high pressure pumps rated with a combined suction & delivery head exceeding 7m (0.7 bar, See p.40). Gallons are imperial, multiply by 1.2 for US Gallons.
For control of parasites etc., much higher levels of UV are required.

ELECTRICAL SAFETY

The pump should be installed according to its instructions, and fitted with a safety circuit breaker (RCD). The RCD should be of the latching type that does not require resetting after a powercut. Some types may be too sensitive to the power surges caused by turning the pump on and off. In these cases a less sensitive RCD may need to be fitted – contact your local electrician for advice.

STRAINERS

BubbleBead XS filters contain internal screens with slots of c. 1.5 mm spacing designed to prevent loss of beads. The backwash process helps to clean these screens, but the rate of internal screen clogging will be reduced if solids of greater than 1.5 - 2 mm and strands of blanketweed are removed before being pumped to the filter. This greatly reduces the need for screen maintenance. Therefore **it is very important to fit an appropriate strainer before the inlet** (Also see Appendix Four). Very fine additional strainers (e.g. open-cell foam blocks) are neither necessary nor desirable, unless specified by pump manufacturers.

The correct size of ultra violet (UV) unit

A UV unit is the most useful piece of extra equipment to use with a BubbleBead filter as it helps to control smaller free floating algae and blooms of bacteria which are too small (< 5 micron) to be readily captured by the filter.

Closed chamber UVs (with a protective quartz sleeve for the lamp) are recommended. An external UV unit can be easily plumbed into the return pipe. Despite small differences in design, the major factor in most UV unit performance is the wattage of the lamp. See the preceding table for the correct wattage for green water control. Where the pond is heavily shaded, control may be achieved with 50% of the wattages listed. In very shallow ponds and in areas where sunlight intensity is greater, a higher wattage of UV light may be required. A **much** higher wattage is required for full sterilization of parasites and other pathogens.

Maintain the UV unit as recommended by the manufacturer. Choose a unit with wide bore connections, rated for flows in excess of the maximum filter flow, so as to prevent back-pressure across the UV. In some cases it may be necessary to use two or more external units **in parallel**. It is generally safe to leave the UV turned on for the few minutes it is left dry, during the filter backwash. If it is likely to be left dry for longer, it should be turned off during the backwash.

Important points

AIR BREAKS AND UNDERPRESSURE

If the filter return outlet beside the pond is below the level of the air inlet checkvalve on the filter, there is a slight risk of siphoning occurring. If siphoning occurs, air can be drawn into the filter through the air inlet during normal running. These bubbles can disrupt the filter media causing water cloudiness and also result in a dripping air inlet.

This is more prevalent on:

- new or very clean filters,
- filters with undersized or low pressure pumps,
- filters with long runs of wide bore piping on the return to the pond, and
- filters where the pump flow has been throttled back, either by a valve on the pump outlet, or because the pump inlet strainer is clogging.

You can tell if underpressure is the cause of a dripping air inlet by placing your hand temporarily over the return outlet to the pond. If the dripping stops within a minute, then underpressure is the likely cause.

Higher return outlets (e.g. to a cascade), reduce the risk of siphoning. Ideally, the return pipe to the pond should enter above water level to create an air break. This also reduces the risk of siphoning and at the same time helps aerate the water returning to the pool.

AERATION OF FILTERED WATER RETURNED TO THE POND

System water **must** be aerated at some point as both the fish and the filter bacteria can consume high amounts of oxygen, especially in warm weather. Returns that encourage some re-aeration of the water are strongly recommended, e.g. cascades. Venturi devices in the pond are an option but some create a great deal of undesirable backpressure whilst others can encourage the underpressure symptoms noted above.

Starting the filter for the first time - test run

Check that the three-way valve is set to direct water from the pump into the filter. Start up the pump, but leave UVs off at this stage. The filter will start to fill with water. On this first time of running you may wish to direct the first few gallons of water to waste, as this will flush out any dust from the pipework.

Check carefully for leaks. If any of the threaded fittings leak, and gentle tightening does not help, the filter will need to be drained, the offending fitting removed and rewound with extra PTFE tape before refitting. Do not attempt to seal such leaks by smearing the outside of the filter with sealant, glue, mastic or repair compounds. This rarely solves the problem, it may make future dismantling difficult or impossible, and it could damage the filter body - voiding your guarantee. Leaks from solvent weld joints will need to be completely dried before attempting to reseal them.

After a leak-free test run, turn off the pump to allow the filter to drain back into the pond. If the filter is sited below pool level, the control valve should be turned to waste to drain the remaining water from the filter.

Beads can now be added to the filter. Disconnect the dismountable union from the top outlet and then unscrew the top outlet strainer.

If there is plenty of headroom: use a funnel with a short length of flexible hose (1¼" (32mm) on the XS-1 & 2, or up to 1½" (40mm) on the XS-4) to guide beads into the filter. Make sure that the hose can't fall in !

If headroom is limited: the lower dismountable union will also need to be disconnected (leave the lower strainer screwed in place) and the filter moved and laid on its side.

◂ With the filter carefully laid on its side and the inlet and outlet facing upwards; use a wide neck funnel or a makeshift cardboard cone in the top (outlet) port, to fill the filter with the supplied beads.

Only use the recommended type and quantity of beads !! (See 'Filter Upgrades (p.31) for maximum bead quantities). Re-fit the outlet screen using fresh PTFE if required. The filter will be heavy when filled with beads, get assistance to move it. All the plumbing fittings can then be reconnected.

Starting the filter for the first time - with beads

Check that the three-way valve is set to direct water from the pump into the filter. Start up the pump, but leave UVs off at this stage. The filter will start to fill with water and you should hear the beads gently rattling against the side of the filter body. The noise will stop once the filter is full. On this first time of running you may wish to direct the first few gallons of water to waste, as this will flush out any dust from the beads.

It is useful to measure the flow rate of water returning to the pond. Use a graduated bucket and stopwatch to calculate the flow rate. Adjust the flow rate as required by using a flow regulator on the pump outlet. Do **not** fit flow regulators on the filter outlet (see Appendix Five).

If you have fitted a pressure gauge, note the typical pressure on the dial and make a note of it (e.g. in a space on page 43).

THE TRIAL BACKWASH

Now is a good time to carry out a **trial backwash cycle**.

1. Turn the three-way valve through 180 degrees from the 'running' position to the 'draining' position to block the flow from the pump into the filter. For most pumps this will not cause any problems for the few minutes that the flow is interrupted, but for more powerful pumps it may be necessary to include a bypass in the inlet pipework (see Appendix Five) or to turn off the pump first. Water will start to flow from the filter through the waste outlet.

2. Immediately, make a note of the time or use a stopwatch. As soon as water starts to drain from the filter, the flap checkvalve on the top outlet will close. The only way that water can continue to drain from the filter, is by sucking in air through the air inlet checkvalve. Put your ear to the side of the filter and **listen** to how a normal backwash sounds. As beads tumble clean in the cascade of air bubbles they will rattle against the side of the filter body. ▸

3. Allow the filter to drain down completely. This first time, the water from the waste valve should be no more dirty than the pond water itself. As soon as the flow from the waste outlet drops to a trickle, make a note of the time or turn off your stopwatch. This draining time is representative of the minimum time that your filter is likely to take for a backwash cycle. It acts as a benchmark to compare with in future. Note this time in the space on page 43. Always allow time for the filter to drain completely.

4. Turn the three-way valve back from the draining position to the running position. If the pump was turned off, restart it now. Note the time taken for the filter to refill. This will also act as a benchmark for the future as it gives an indication of the cleanliness of the pump and inlet strainers. Note this time also in the space on page 43.

5. Your filter is now tested and operating correctly. The floating bead media packs down in the top of the filter and will soon start to filter out particles. Filtration of finest particles and biological breakdown of wastes also takes place here once the filter has matured.

Running-in your filter

Apart from backwashes, your filter should run 24 hours a day to support the biological organisms that will colonise the filter media; just like your fish, they need oxygen and food (the fish wastes) to survive.

Although mechanical filtration starts straight away, it can take up to three months for full biological activity to mature, especially in brand new ponds and in cold weather. Patience is necessary during this phase. If there are no fish in the pond, commercial additives are available that contain ammonium salts and nitrites that imitate fish waste and help the filter to mature.

There are a number of steps that you can take to aid the maturing process:

1) Do not immediately introduce large numbers of fish. Build up fish stocks gradually, using hardy fish of lower value to begin with.

2) Feed fish more lightly than normal in the first two months.

3) After the first few days of operation, add a commercial filter seeding agent that contains filter bacteria. Alternatively swill out the debris from an existing active pond filter and pour it into the pond near the pump intake.

4) Avoid the use of pond medications during the filter maturing period. Some medications can severely disrupt filter organisms and many medications can temporarily reduce filter activity, especially on the first time of use. If in doubt, ask a specialist before using any treatments.

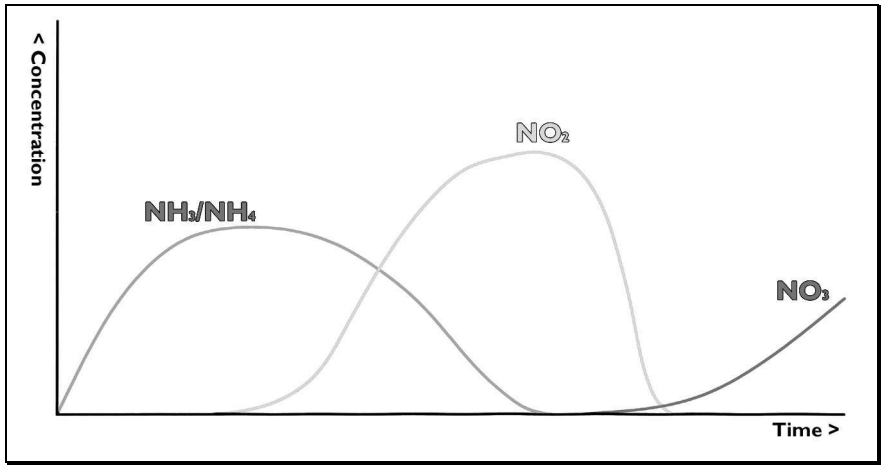
5) Avoid turning on UV units during the first month. The water may green temporarily but this is rarely harmful.

You can monitor the maturing process by using standard pond test kits. The most useful ones at this stage are pH, nitrite (NO_2), ammonia/ammonium (NH_3/NH_4) and nitrate (NO_3).

The pH should remain relatively stable and need only be checked occasionally at this stage. Typically, acceptable pond pH values range from 6.5 to 9.0 with the ideal range for pondfish being between 7.0 and 8.5.

ESTABLISHING NITRIFICATION

The major soluble waste product produced by fish is ammonia and its ammonium salts, and this is the first product to build up in the water. Bacteria that break down organic wastes and uneaten food also add to the levels of ammonia in the water. Within a week or two (in a few days in warm weather), specific bacteria that feed on ammonia start to build up on the surfaces of the beads in the filter, and they begin to break the ammonia down into nitrites. As the nitrite levels become more detectable in the water, the ammonia levels usually start to fall. Finally, other specific bacteria increase in numbers to feed on the nitrites converting them to nitrates. The whole process that results in the breakdown of these nitrogen containing products is known as **nitrification** and the fluctuations in these waste products typically follows the pattern illustrated in the adjacent graph.



Typical water quality during filter maturation

Ammonia (NH_3/NH_4) and nitrite (NO_2) are both stressful to fish, and whilst they are present in the water, new additions of fish should be avoided. Once the filter has matured sufficiently, these two waste products should be reduced to below detectable levels and only the more benign nitrate (NO_3) may be detectable. However, a sudden increase in loading at any stage (with fish or fish food) may overwhelm the filter resulting in a reappearance of ammonia and nitrite until the filter bacteria can increase in numbers to cope.

If ammonia or nitrite appear in the water after the maturing period it can suggest problems, and these are dealt with in the Troubleshooting section on Water Quality in this guide (Appendix Two).

When to backwash the BubbleBead filter

During the maturing period, whilst new ponds are relatively free of waste, the filter will take some time to become dirty. The delicate film that supports the growing filter bacteria will also begin to form on the surface of the beads. In order to avoid disrupting the bacteria at this crucial early stage, avoid backwashing the filter for two to four weeks, especially in relatively clean ponds. The major sign that a backwash is necessary is when there is a notable drop in the flow from the filter outlet. Check that this is not merely due to the strainer on the pump becoming clogged. If the flow has dropped to around a half to two thirds of the initial rate, (or the inlet

pressure gauge, where fitted, has risen to 1.4 psi / 0.1 bar above the typical level when clean) then the backwash procedure **must** be carried out.

MONITORING THE STANDARD BACKWASH

Listen for typical sounds as the beads tumble clean in the cascade of air bubbles. Observe the waste water. Dirt trapped by the screen will wash out at the beginning of the backwash, and dirt from the beads will wash out near the end. For best results allow the filter to drain down completely. Whilst the filter is backwashing, it is a convenient time to turn off the pump for routine maintenance e.g. cleaning pump strainers.

On restarting the filter, it is quite normal for the first few gallons of water returning to the pond to be a little cloudy. This is not harmful and the filter will soon remove these particles and maintain the clarity of the pool (see page 30 for further comments). It makes sense not to carry out a backwash immediately before any important viewing of the pond.

After the initial maturing phase in the filter, the standard backwash frequencies **must** be implemented. Once fully established, the beneficial bacteria on the surface of the beads can withstand numerous backwash cycles without any major disruption of nitrification. Indeed, tests have shown that the gentle bubble-wash actually improves the efficiency of nitrification by the filter bacteria. If in doubt …..backwash.

The Recommended minimum backwash cycles for your model:

MODEL	MINIMUM BACKWASH FREQUENCY			Typical Backwash Water Loss (approximate)
	Winter < 10 degC	Spring & Autumn	Summer	
BBF - XS1	Once or Twice Weekly	Twice Weekly	Every One to Two Days	10 Gallons 45 Litres
BBF - XS2	Once or Twice Weekly	Twice Weekly	Every One to Two Days	21 Gallons 95 Litres
BBF - XS4	Once or Twice Weekly	Twice Weekly	Every One to Two Days	37 Gallons 170 Litres
On typical koi ponds a daily backwash gives the ultimate filter performance. Carry out a series of extra backwashes once per month and use the sediment drain to reduce long-term maintenance (see p.24-25).				

The regular backwash removes solids from the system **before** they break down. Also, by removing wastes at this stage, nutrients are removed from the water and the growth of algae can be reduced further. The process keeps the filter at maximum biological efficiency and minimises the need for any other maintenance. Regular backwashing is essential in heavy loading situations. On aquaculture systems the filter can be backwashed two or more times a day if required. Once it has matured, you simply cannot backwash a BubbleBead filter too often.

The gentle, bubble-wash process is a key to the efficiency of the BubbleBead filter. It aids cleaning of the beads whilst maintaining a healthy thin film of biological organisms on the bead surface. Unlike static chamber filters where media can become coated in an excessively thick biofilm, the bubble-wash ensures that the maximum proportion of bead surface area is always available for biological filtration to take place.

FITTING A TOP-UP VALVE

A standard cistern ballcock valve, 'Torbeck' valve or similar can be used to top up the pond automatically. This makes up for water lost through filter backwashing and from normal evaporation. To prevent fouling of the valve, and disruption from small waves, it is common to place this in a separate cistern mounted at pond level and connected through the side of the pond with a link pipe. To meet water board requirements it is usually necessary to fit a double-check valve in the supply line, to prevent siphoning of pool water into the mains water supply in the event of pressure drop. Some authorities also require such water use to be metered.

Where only small quantities of water are being added in a day (1 to 2% of pond volume) the dangers from chlorine in the water are minimal. Where larger volumes are being added, or if there are particular worries regarding tap water quality (e.g. chloramines, metal content) it may be wise to use an appropriate water conditioner or to fit a tap-water purifier in the feed pipe. This make-up water, following backwashes, can add up to a valuable portion of the water changes required in any system stocked with numbers of fish.

Long term maintenance

MONITORING

It is **important** to periodically monitor the backwash operation:

- listen to the beads sloshing in the filter

- check the backwash time

This will show up any possible problems before they become serious.

ADDITIONAL MONTHLY MAINTENANCE

In addition to the standard backwashing regime, we recommend that once a month: 1) The additional drain is flushed (see below), and 2) A series of extra backwashes carried out. By carrying out three to five backwashes in a row, any more persistent wastes can be dislodged from the filter. Note the extra monthly maintenance in your diary, or put a calendar sheet by the filter to remind you. On aquaculture and other heavily loaded systems this procedure can be carried out every one to two weeks.

CHECKVALVES

The top-outlet checkvalve and air inlet checkvalve are low maintenance items. Very occasionally the facing or seating may need cleaned. If the air inlet drips, see the section on air breaks and underpressure (page 16), and the troubleshooting guide (page 30).

PUMP STRAINERS

Remember that the strainer on the pump will need to be cleaned from time to time. If this becomes clogged with debris or blanketweed, the filter may not fill or drain correctly, flow rates will be affected, and water may drip from the air inlet.

WASTE AND TOP OUTLET SCREENS

Over time, the lower outlet screen (or very rarely the top outlet screen) may slowly clog with more persistent and immoveable dirt, strands of algae, or snails. This can lead to much longer backwash times. It is recommended that at least once per year, whilst the filter is drained, the

union nuts on the screens are undone to allow a visual examination of the inside of the screens whilst they are in-situ. They can be cleaned if necessary by using an appropriate stout bottle-brush. If dirt proves difficult to shift, it may prove necessary to remove the screens for cleaning.

Screen maintenance is **greatly** reduced if a suitable pre-strainer is used before the filter (pages 16 & 37) and the recommended backwash regime is followed.

The sediment drain

BubbleBead filters' main waste outlet is in the base (unlike some filters), and this facilitates good removal of the particles loosened from the beads during backwash. Nevertheless, sediments from soil or sand drawn into the filter, and sludge residue, can build up on the filter base in long-term use. Normal backwash cycles may not remove all of this. XS filters are fitted, as standard, with an additional, unscreened drain to assist removal of such sediments. Sludge tends to be a more common problem on aquaculture and grow-on systems where there is a constant heavy loading, and on watergarden ponds where there is soil seepage into the water.

Waste from this outlet can be run into a bucket and poured away, or directed to waste through a hose. This outlet is an **unscreened drain,** and should only be turned on when the filter is running and **full** of water, otherwise beads can be lost!!!

As a guide, this valve need only be turned on once a month for a few seconds. If very little sludge is apparent, you can reduce using the valve to once every two months. Conversely, if this valve releases noticeable amounts of sludge, increase the frequency of draining appropriately.

Winter Running

In the winter when temperatures are lower (below 8-10°C), feeding rates for koi should be reduced and maintenance can be less frequent. To avoid chilling the fish in water currents, avoid drawing in water from the pool

base and instead draw from 30-60 cm below the surface. Consider reducing the flow rate through the system – biological and filtering activity will still take place in the BubbleBead Filter even at 30% of maximum recommended flows (though this might lead to underpressure, see p.16).

Ice can damage your filter! Wherever penetrating frost may be a problem, insulate the filter; filter pipework and valves; external UVs; and any top-up valve and pipework. Take especial care of pipes where there is infrequent water movement e.g. the waste pipe and any extensions to the air inlet pipe. Standard closed-cell pipe insulation wrap and hot-water-cylinder jackets can be used but make sure that they are kept **dry** for maximum insulation. As the filter is sealed, and produces no smells, it is often desirable to position it in a frost-free outhouse, garage or utility room. This gives additional protection from freezing even if the pump should stop due to power failure.

CLOSING THE FILTER DOWN AS AN OPTION

On smaller systems and in very cold climates, an option is to turn the filter off after the first severe frost and leave it clean and dry until the spring. To prepare it for winter carry out five backwashes in a row to leave the beads as clean as possible, and then leave the filter dry. Disconnect the pump from the inlet and leave the outlet completely open. The filter will need time to re-mature in the spring.

Water Quality Maintenance

The filter may have passed its initial maturing period, but biological filters continue to mature over months and years as different micro-organisms establish on the filter media. This maturing process can be set back by long power cuts or when pool treatments are used, especially for the first time.

PARTIAL WATER CHANGING

The water quality also continues to change due to the gradual build up of products in the water e.g. nitrates (NO_3) & dissolved solids. Conversely, some minerals may become depleted in the water as they are used up by the fish, plants and filter organisms. In lakes this aging process in the water body is offset by fresh water from streams and heavy rains bringing in new supplies of minerals, and flushing out wastes that are building to excess. In

a closed system like a koi pond it is necessary to carry out regular **partial water changes** to mimic these natural refreshing processes.

The backwash process loses some water, which will need to be made up with new water added to the pond. This is most easily carried out with an automatic top-up valve. This waste removal and top-up acts as a partial water change. In a system running at close to maximum pool volume capacity, the lower recommended frequency of backwashing might only result in a water change of around 1% in a summer week. This level of water changing is much too low to maintain water quality in the long term and additional partial water changes will be necessary.

USE BACKWASHES TO WATER CHANGE FOR YOU

Regular backwashes can act as part of your water change regime. 5% per week in the summer is the rate used by many koi-keepers. The table (page 14 or 22) gives typical water loss per backwash. A high frequency of backwashing does not upset the filter organisms in a mature filter but actually improves filter efficiency.

Adding water to make up for evaporation is **not** equivalent to a water change, as this does not remove any waste products. Water needs to be removed from the pond e.g. through the backwash cycle; from a bottom drain; or with a pool vacuum; **before** water is added. Use a tap water conditioner or appropriate tap water filter to make large quantities of chlorinated water safe to add to the pond. Take advice from local specialists if your source of water has chloramines, is direct from a borehole, or is high in metals such as iron.

MONITOR YOUR POND AND FISH TO AVOID PROBLEMS

Monitoring the general water appearance and the behaviour of fish is invaluable as a guide to water quality, but the only sure way to know is to carry out regular water quality checks. Use a range of good quality pond test kits as stocked by all major aquatic stores. By keeping a record of changes in water quality, problems can be avoided before they take hold, and the overall health of the fish and pool system maintained. Appendix Two contains a useful troubleshooting guide to water quality to be used in conjunction with other sources of information on good fish husbandry. It may help to read through it **before** problems occur.

APPENDIX ONE - Filter Troubleshooting

? – The water has suddenly become green / milky grey

▶ Algae blooms (green water) and bacterial blooms (milky grey water) can sometimes occur, especially during the maturing period or following a sudden increase in dissolved nutrients. An effective UV unit can prevent this problem occurring. If a UV does not appear to be working, check the lamp and clean the quartz sleeve if necessary. Water with high mineral content can sometimes coat the quartz sleeves, screens and beads in scale; use of magnetic/electromagnetic devices often alleviates this problem. Other sources of cloudiness include excess food and particles washed in from surrounding soils. Temporarily cease feeding and consider the very sparing use of flocculating agents (but not in very soft water).

? – The water has suddenly become very dirty

▶ If air is being drawn into the filter system during normal running, it will disturb the beads and prevent them from catching dirt properly. Check that there are no pipework leaks around the pump or filter inlet and that the pump is not clogged or drawing in air from e.g. airstones. Check that the filter return to the pool has not been moved to a lower position, or into the water itself, as siphoning at this point can draw air into the filter through the air inlet valve (see page 16 - underpressure and air breaks).

? – There has been a powercut

▶ In sites where the filter is above the pool/tank, and there is no checkvalve in the inlet line, or footvalve on the pump, the filter will drain back down into the pond. This will cause some temporary clouding of the water, but it will leave the beads in moist air in the filter chamber and this allows the filter organisms to survive for 18 hours or more.

If the filter is below pond level, or the inlet line has a checkvalve, the filter will remain full of water. In such cases, if the powercut has been only a few hours long, there should be no problems providing the filter has been maintained correctly. RCD devices on the system should be latching types that restart automatically. However, if the filter has been particularly dirty; or feeding levels particularly high; or the weather particularly hot; then the filter organisms may rapidly run out of oxygen. In these cases or where the powercut has been lengthy (over 5 hours), carry out a backwash as soon as the filter has refilled, to remove foul water and dying organisms. Avoid feeding for a few days and monitor the water for ammonia and nitrite.

? – The filter takes much longer to drain during a backwash

? – I can hear the bead bed dropping in one lump (with a 'thunk') during the backwash cycle

? – The filter sounds different during the backwash cycle

? – The pressure gauge reading does not drop to the normal level after cleaning

▶ Slow draining can be due to gradual clogging of the waste outlet screen inside the filter, or 'gelling' of the bead bed. Screen clogging can be due to strands of algae; growths of sponge-like bryozoans within the filter; or tiny snails which have become wedged in the slots. Gelling of the bead bed is caused by beads sticking together due to an excessive growth of the biological film on the bead surfaces as a result of infrequent backwashing.

Regular backwashing of the BubbleBead filter can eliminate most of these problems before they occur.

If these problems occur, backwash your filter five to seven times in a row and increase the frequency of the regular backwash. If problems persist:

Drain the filter. Check that the main pump strainer is not clogged. If necessary, clean the lower and upper screens on the filter (see p.24-25). If the lower screen has clogged rapidly, improve the strainer on your pump inlet (p.15 & 37). Make sure that the additional drain valve is being used as suggested (page 24-25).

Take steps to improve the backwash strength e.g. increase the siphon action by increasing the waste pipe length or head (see page 5) and minimise restrictions on the waste outlet.

For persistent gelling of beads, either:

- Seal either the inlet or waste outlet. Turn off the pump and turn the three-way valve to the sealed position leaving the filter full of water. Inject air into the air inlet valve with a blower or strong aquarium airpump for 30 to 60 minutes. The air accumulates under the bead bed, eventually working its way upwards and breaking up the beads. Then carry out the backwash process six or seven times in a row before restarting the filter.

- Partially drain the filter, remove the top outlet screen, and break up the beads with a jet of water from a powerful hose or jet-washer. Reassemble the outlet and carry out a series of backwashes.

? – The air inlet drips water

▶ Check for 'Underpressure' symptoms, p. 16. If resolving this, or cleaning the valve, does not help, fix a 30 cm (12") long upright vertical pipe into the air inlet. This should stop the drip.

? – I don't like the plug of cloudy water that is sometimes seen in the filter output just after restarting the filter

▶ This is normal for most bead filters and does not harm the fish. Reduce the density of clouding by increasing backwash frequency, or carry out a second backwash when the filter has partially refilled. However, if you wish to eliminate clouding, fit a tee & valve, or a 3-way valve, on the filter outlet pipe and direct this plug of water to waste for a **few seconds**. Use a sight glass or a piece of clear hose in the waste line to monitor water clarity.

? – The backwash appears to stop before the filter has emptied

▶ This can happen if there are airlocks in the waste pipe or if the inlet/waste screen is becoming clogged. Carry out routine maintenance (page 24).

? – Filter water runs back into the pond if the pump is turned off

▶ This can happen where the filter is mounted above the pond. In most circumstances the pump should only be turned off whilst the filter is in the backwashing mode. Carry out routine pump maintenance while the filter is backwashing or drained. If regular short powercuts are causing backflows and clouding of the water, consider fitting a flap checkvalve somewhere in the inlet line to prevent backflow.

? – I'm going away on summer holiday for two weeks

▶ In lightly stocked water garden ponds the fish will find some natural food. This can be supplemented by small amounts of food from an automatic fish feeder. It is worth carrying out routine maintenance (page 24) some days before you go on holiday, to check that everything is in order.

Alternatively, as the reduced feeding will reduce the loading on the filter, it should be possible to leave the filter for the two weeks without a backwash. (Remember that very high pressure pumps must always be fitted with a pressure-release bypass, see page 40). Carry out a series of five backwashes both before leaving and on your return. If someone is coming in to feed the fish, shown them how to operate the simple backwash process. An automated top-up system will also help here.

? – How can I use my pump to drain the pond through the filter ?

After carrying out a backwash, turn the three-way valve to the 12 o'clock position. The pump will then flush pond water to the waste outlet.

Further answers are on the website 'F.A.Q.' pages:

www.bubblebeadfilters.co.uk

If you experience other problems, not mentioned here, please seek further advice from your dealer (or the distributor - contact details on the inside back page). Unauthorised repairs or modifications may void the guarantee!

Filter Upgrades

The BBF-XS2 and BBF-XS4 are the first BubbleBead Filters to be made available that can be uprated to cope with higher loading rates by adding additional beads. As additional beads leave less room in the filter for the backwash process, it is particularly important that these backwashes are effective and frequent. For this reason we stipulate that upgrades should **only** take place where:

• Backwashes take place at least on a *daily* basis

• The recommended additional backwashes and sediment drain use take place at least as frequently as directed

• The siphon head has been increased by at least 60cm (page 5)

In these cases the following upgrades are possible:

BBF-XS2 - add ½ cubic foot of bead media (= 2.5 cubic feet maximum capacity) to increase the loading rate to 560gm of food per day (1¼ lb)

BBF-XS4 - add ½ cubic foot of bead media to increase the loading rate to 1Kg of food per day (2¼ lb), or

BBF-XS4 - add 1 cubic foot of bead media (= 5 cubic feet maximum capacity) to increase the loading rate to 1.1Kg of food per day (2½ lb)

The BBF-XS1 is **not** upgradable (= 1 cubic foot maximum capacity)

Contact your dealer or the distributor for details of bead media prices

APPENDIX TWO - Water Quality Troubleshooting Questions (?), Comments (▷), and Actions (▶)

▶ If **any** problems occur, carry out a full range of water quality tests.

? - Fish are hanging near, and/or mouthing at the water surface

▷ This can indicate a lack of oxygen entering the fish bloodstream. It may be due to low oxygen levels in the water or other problems with either water quality or the gills of the fish which are preventing the fish from extracting oxygen from the water. Less oxygen dissolves in the water in hot weather; in salty water; and at high altitude. Oxygen levels may also drop due to decaying waste; algae growths using up oxygen at night; or following the use of certain chemicals.

▶ Immediate: Increase oxygen levels by encouraging splashing at the water surface with cascades or fountains. Use air pumps and airstones in the pond. Temporarily reduce or cease feeding. Keep the water surface free from excess floating leaves. Examine fish gills for signs of damage or parasite infection. Carry out a partial water change taking care to remove decaying sediments.

▶ Long Term: Control excess algae growth. In heavily stocked systems, consider the permanent installation of additional aeration devices e.g. trickle towers.

? – The pH is rising unusually high (over 9.0) – alkaline conditions

▷ High pH values can directly irritate fish gills and mucous membranes as well as reducing the efficiency of nitrifying bacteria in the filter. Waste products such as ammonia are much more toxic to fish at high pH levels.

▶ Immediate: Reduce or cease feeding. Check ammonia levels. Carry out a series of partial water changes. Consider using pond pH buffers designed to lower pH.

▶ Long Term: Discover the source of the high pH. Uncured cement-work may need to be removed from the system or sealed in some way. If it is due to the replacement water source get advice from your local supplier. If it is due to strong photosynthetic activity by algae, carry out algae control measures.

? – The pH is unusually low (below 6.5) – acid conditions

▷ pH levels can fall due to the build up of nitrates or carbon dioxide (CO_2) in the water. Certain minerals in the water buffer the pH and prevent sudden drops but if these minerals have been exhausted, the pH can be unstable. Low pH water irritates fish gills and mucous membranes, reduces the efficiency of nitrifying bacteria in the filter, and makes some metals (e.g. copper from medications/algicides) more toxic to fish.

▶ Immediate: Reduce or cease feeding. Check carbonate hardness (KH) levels (see below). Carry out partial water changes.

▶ Long term: Monitor KH levels; increase the rate of water changes.

? – The carbonate hardness (KH) is low (below 3 degrees)

▷ Carbonates and bicarbonates (CO_3 + HCO_3) together represent the alkalinity and buffering capacity of the water. They are used up by the filter bacteria in the process of nitrification. Low KH is most notable in systems where the top-up water is naturally soft (KH 3°/50ppm or less) and where feeding rates are high.

▶ Immediate: Reduce or cease feeding. Carry out a series of partial water changes. Consider the cautious use of buffering compounds such as sodium bicarbonate ($NaHCO_3$) or powdered calcium carbonate ($CaCO_3$).

▶ Long term: Increase the frequency of partial water changes. Choose a replacement water source with naturally high carbonate levels. Add slow release buffers to the pool system e.g. tufa rock; crushed oystershell. In heavily loaded systems the regular addition of carbonate buffers may be necessary.

? – Ammonia/Ammonium levels (NH_3/NH_4) are high

▷ Outside the filter maturing period, high ammonia levels are usually caused by overloading or disruption to the filter organisms.

▶ Immediate: Reduce or cease feeding. Increase aeration. Check and remove causes of filter disruption. Carry out partial water changes.

▶ Longer term: Aim to avoid high pH values as ammonia is more toxic in these situations. Take steps to prevent future disruption/overloading of the filter. Add commercial cultures of nitrifying bacteria to the system.

? – Nitrite levels (NO_2) are high

▷ Outside the filter maturing period, high nitrite levels are usually caused by overloading or disruption to the filter organisms, or pockets of decaying material building up in anaerobic (low oxygen) areas in the system.

▶ Immediate: Reduce feeding. Increase aeration. For salt tolerant fish such as koi, add 1 gram per litre* (0.1%) of food-grade salt to the water as this reduces nitrite toxicity.

▶ Long term: Avoid disruption of the filter organisms by e.g. medications and other chemicals; ensure that mature filters are being backwashed sufficiently; avoid excessive backwashing in new and maturing filters; add commercial cultures of filter bacteria. Monitor the KH level too.

? – Nitrate levels (NO_3) are high (over 100 mg/L total nitrate)

▷ – Nitrates build gradually in most closed systems. They are not especially harmful to freshwater fish and immediate action is not called for unless levels exceed 300 mg/L. However, chronic, high levels of nitrate are considered to lower the immunity of fish to disease, and may reduce growth rates.

▶ Long term: Carry out more frequent backwashes and/or partial water changes. Consider using plants to reduce nitrate levels. Certain designs of trickle tower may help to reduce nitrate levels. Monitor KH levels.

? – There is a high level of suspended solids in the water

▷ Suspended solids can irritate fish gills. Organic solids reduce oxygen levels & increase levels of bacteria in the water & may lead to gill disease.

▶ Immediate: Find and remove the source of the solids e.g. poor quality or inappropriately sized food; run-off from surrounds following rain; air being drawn into the BubbleBead (see page 28 point 2).

▶ Long term: Increase circulation to draw particles into the filter more quickly. Use bottom drains or vacuum devices to remove sediments. Use quality foods. Don't overfeed fish.

? – The water has a yellow tint

▷ In any closed system there is a gradual build up of complex waste compounds e.g. phenols, which cannot be easily broken down by the filter. These can eventually discolour the water but are not normally harmful.

▶ Long term: Increase the level of backwashes and/or partial water changes. Temporarily use activated carbon in the system. Use a protein skimmer (foam fractionator), especially in salted systems. Cautious use of ozone dosing devices can help. Changing food brands can sometimes help.

? – The water has excessive amounts of foam at the surface

▷ Foaming is caused by high levels of surfactants in the water, the most common being types of protein. Some foaming may be expected during the filter maturing process but this usually disappears once the filter has fully matured.

▶ Immediate: Carry out a partial water change taking care to remove uneaten food and excess sediments. Consider the use of pond anti-foaming treatments.

▶ Long Term: As for yellow tinted water (above). Check that any filter-foam products used in the pool are fish-grade quality, inferior grades can break down and cause foaming. Consider fitting a surface skimmer.

? - How can I control blanketweed (thread algae) in a pond?

- Avoid debris or soil washing into the pond. Provide shade from excess sunlight. Avoid limestone rocks. Avoid long shallow streams as these tend to encourage algae. Avoid overfeeding fish. Use plants to soak up nutrients.

- Physically remove algae using a stick, net, or plastic lawn-rake - this is fairly effective but time consuming. Remove the bulk of blanketweed growth **before** using any chemical or electronic controls, as dying algae can rapidly pollute a pond.

- Regularly remove sediments from the pool with a bottom drain or vacuum. Clean strainers and settlement areas in filters on a regular basis.

- Some algae are to be expected in all garden ponds. Mature ponds that are not overstocked with fish tend to have the fewest problems. Do remember to backwash the BubbleBead filter at suitable frequencies.

APPENDIX THREE - Installing UV units

Germicidal UV radiation has been shown to be most effective in controlling green water algae in ponds. Commercial UV units are now widely available.

Be sure to choose a unit:

- of sufficient wattage (see the table on page 15)

- designed to cope with the expected flow rates without causing excess restriction. The fittings on the unit should ideally be at least as large as the return pipework used, e.g. if 1½" hose is being used on the return pipework, the unit should be used with 1½" hosetails. (A unit with 1" connections adapted up to 1½" hose would not be suitable unless a bypass was fitted, or unless two units were used in parallel.)

INSTALLATION

UVs are best plumbed into the clean water flow returning to the pond from the filter. Be sure to support the UV and pipework sufficiently with brackets and pipe clips etc. Unsupported pipework on the filter outlet could damage the filter and void your guarantee. Ensure that the unit is accessible for maintenance, dismountable for repair/replacement, and that electrics are suitably protected from water. [The small brass thread sockets in the XS filter body are designed to support a UV kit of a brand available to US customers only.]

OPERATION

Never look directly at any UV lamp when lit. The UV radiation is damaging to both eyes and skin! Only operate the UV when the lamp is safely inside the unit and the filter is running. The UV should be OK running 'dry' for the short few minutes of a normal backwash. It could be turned off during the backwash, though excessive switching of the lamp can shorten its effective life. Follow the manufacturer's guidance on maintenance and lamp changing.

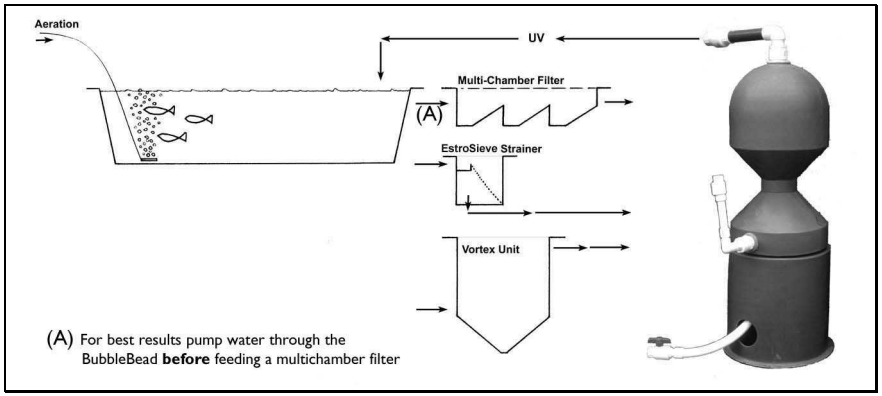
On new systems it is best to leave the UV turned **off** during the first two to four weeks of filter operation. This minimises damage to beneficial bacteria present in the water flow whilst the filter is maturing.

APPENDIX FOUR -

Combining BubbleBead Filters with other filter equipment

The BubbleBead filter is ideal to use alongside existing filter equipment and can boost the filtration capacity of any system. This is particularly useful if an increase in fish stocks is overloading the existing system. In particularly high loading situations the BubbleBead filter can be supplemented with ancillary equipment to give the best results.

Aeration is recommended in all cases. Where natural aeration from waterfalls or fountains is limited, the most convenient form of supplementary aeration is to use a high efficiency air pump with airstones in the pond. Ensure air bubbles do not get drawn into the BubbleBead filter.



Pre-Filtration can be achieved with **sieve devices, surface skimmer-boxes, in-line coarse strainers, vortex units** and existing gravity-fed settlement or **brush chambers.** Water can be pumped from these to the BubbleBead Filter as shown. However, it is important to clean these pre-filters very regularly to remove organic waste before it is broken down, otherwise blanketweed growth may be a more noticeable problem. Any pre-filter to the BubbleBead should aim to remove particles larger than 1.5 mm.

The solids removal abilities of vortex units can be significantly improved by fitting brushes near the outflow or retrofitting commercial devices such as 'The Answer' which is a type of **self cleaning strainer**.

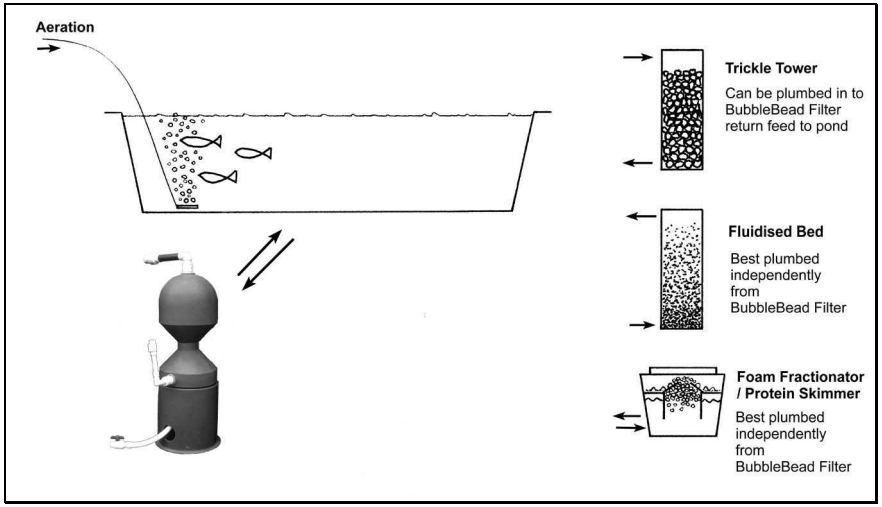
With existing **gravity-fed multichamber systems** the most straightforward option is to pump the water from the last chamber of the filter to the BubbleBead filter and then back to the pond through a UV unit. Alternatively, the original chamber-filter pump can be kept running and an additional pump used to feed water from the middle chamber to the BubbleBead either back to the pond, or back to the next chamber.

The BubbleBead filter will give additional nitrification of fish wastes and will also help to 'polish' the water by removing the small particles that can sometimes get through multichamber systems. **However**, this arrangement does **not** make use of the BubbleBead filter's ability to remove the bulk of solids from the system before they break down, and unless excess solids are regularly removed from the multichamber filter there may be an increased tendency for blanketweed growth in the system. It may be possible to adapt the multichamber filter to pump fed operation.....

For existing **pump-fed multichamber systems**, the water should be pumped instead to the BubbleBead filter, through a UV unit and into the chamber filter before returning to the pond by gravity. When regular backwashes are carried out this will make the best use of the BubbleBead's ability to remove fine solids from the system before they are broken down. The multichamber filter will then remain cleaner and more able to function as a biological filter rather than a mechanical trap for sediments. It is important to use a pre-filter on the pump feeding the BubbleBead filter to remove larger solids; and to ensure sufficient aeration in the chamber filter's transfer ports. This arrangement is not suited to pressurised chamber filters.

Trickle Towers can be fed from the outflow of the BubbleBead filter, following UV treatment. The trickle tower greatly boosts oxygenation of the water and assists nitrification. Water then flows back to the pond from the trickle tower under gravity. In heavily loaded commercial situations the trickle tower may be fed with a forced counter-current flow of air.

Actuated ball valves can be used on the waste outlet line, with a timer, for fully automatic backwash. In this case the 3-way valve should be replaced with a plain tee, and a one way flap valve (or spring loaded valve for below pool siting) fitted on the inlet line. Ask your dealer for details.


Aeration
Trickle Tower
Can be plumbed in to BubbleBead Filter return feed to pond
Fluidised Bed
Best plumbed independently from BubbleBead Filter
Foam Fractionator / Protein Skimmer
Best plumbed independently from BubbleBead Filter

Fluidized Bed Filters boost nitrification capacity in heavily loaded systems but are unable to remove solids. They can be used alongside the BubbleBead Filter which will remove the solids from the system.

Foam Fractionators (Protein Skimmers) aid the removal of proteins and other surface active compounds from the water, reducing the load on other filter equipment and improving water clarity by removing staining compounds. Although foam fractionators show some benefits in freshwater, they work most efficiently on marine systems. They are not intended to remove solids from the water.

Certain foam fractionators can also be used with specialist ozone systems to control yellowing of the water and to reduce slime and algae growth.

Both fluidized beds and fractionators should be plumbed **independently** from the BubbleBead Filter. If a heating device is used, it is recommended that this is also plumbed independently from the BubbleBead Filter.

APPENDIX FIVE

- Using the filter with a high pressure pump

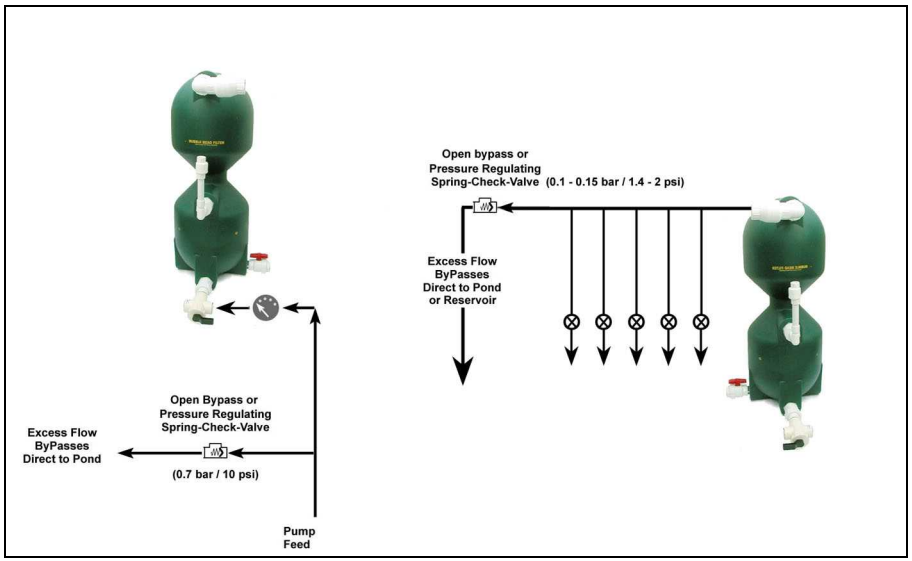
- Fitting manifolds to the outlet pipework for returns to multiple tanks (e.g. shop and aquaculture systems)

- Using flow control valves on the return pipework

When using high pressure pumps on the filter inlet, a bypass is essential to prevent damage to the filter body and possible leaks from fittings. This will also allow circulation to continue during the backwash cycle. The filter is rated to 0.7 bar (7 metres head). It is **essential** that a bypass/pressure release is used on systems with pumps rated with heads of over 7 metres, and no pumps of over 10m head are used. A pressure gauge is also recommended.

Using narrow pipe manifolds, small bore UV units, and/or valves on the filter outlet can create unwanted backpressure in the filter system, increasing the likelihood of weeping from the threads. In cases with high pressure pumps, the pressure in the filter system can also exceed rated limits. Fit a bypass or pressure release on the outlet manifold.

The diagram shows where a bypass or pressure release valve could be fitted in a system with a high pressure pump (left), or with a manifold on the outlet (right).



Filter Specifications

Details of the filter dimensions and specifications are given in the table on page 14, including approximate backwash volumes. BubbleBead Filters undertake continuous product development may make technical modifications in current models. The information and pictures shown here are for guidance only.

Pipe fitting sizes on inlet/outlets

Your dealer can supply a fittings kit to convert your XS filter to suit flexible hose connections.

The standard fittings are as follows:

Model	**BBF-XS1 & BBF-XS2**	**BBF-XS4**
Inlet:	1½" fem solvent	2" fem solvent
Waste:	1½" fem solvent	2" fem solvent
Top Outlet:	1½" fem solvent	2" fem solvent
Additional Drain:	1½" fem thread	1½" fem thread

Solvent fittings are for pressure pipe (swimming pool pipe)

References and Sources:

AST technical literature, and:

Malone, R.F., Beecher, L.E., 2000. Use of floating bead filters to recondition recirculating waters in warmwater aquaculture production systems. Aquacultural Engineering 22: 57-73.

Malone, R.F., Rusch, K.A., 1998. Using the bead filter in your koi pond (Second Edition). Louisiana Sea Grant College Program. 50pp.

Drennan, D.G., Golz, W., Ahmed, H., Malone, R.F., 1995. Clarification abilities of floating bead filters used in recirculating aquaculture systems. In: Aquaculture Engineering and Waste Management, Proceedings from the Aquaculture Exposition VIII and Aquaculture Mid-Atlantic Conference, Washington, D.C., June 24-28, pp. 256-267.

If the filter should arrive damaged or with parts missing please contact your supplier immediately, and confirm losses in writing within seven days to allow the problem to be corrected.

FILTER GUARANTEE

The filter manufacturer guarantees that the filter material and workmanship are free of defects. The guarantee is valid for paid goods and runs for one (1) year from the date of delivery.

Any filter returned to the dealer or distributor carriage paid, which is proved to the manufacturer's satisfaction to be faulty by reason of defective material or workmanship will be replaced or repaired, at their option, free of charge, provided it has not, in the manufacturer's opinion, been subjected to misuse, neglect or accident. In particular:

1) The filter should have been installed and maintained in accordance with the instructions.

2) Excessive weight due to heavy pipes, valves, etc. should not be carried by the inlets or outlets.

3) The filter hull pressure is at no time to be allowed to exceed the maximum pressure rating as specified by the manufacturer.

The guarantee does not apply to filters used for other than the intended purpose; those altered, repaired or modified by other than an authorised repairer; or those used with other items where the integrity, performance or safety of these items is affected. Damage by natural forces such as storm, ice, or animal, is excluded from the guarantee.

The distributor and the filter manufacturer will not be liable for any direct or consequential loss. Any claim made under this guarantee must be accompanied by proof of purchase. This guarantee does not affect your statutory rights as a consumer.

If problems should arise, in the first instance contact your local dealer or your nearest distributor (see page 43)**.**

Typical measurements for your BubbleBead filter

(see pages 18-19)

Time taken to *drain* the filter when relatively clean: _____

Time taken to *refill* the filter when relatively clean: _____

Troubleshooting

If you have problems with **water quality** please first read the appendix starting on page 32.

If you are encountering difficulties in **maintaining your filter**, please firstly read the sections starting on page 21-24 & 28.

The BubbleBead Web-Site carries useful support information:
www.bubblebeadfilters.co.uk

If you require further assistance please contact your dealer or contact your local area Distributor. It is a help to have all the relevant information about the filter, model number; pump type; valves and hoses etc. to hand.

Distributors:

Aquatica International, England
Tel: 020 8669 6643 *(Fax: 020 8773 2035)*
Email: info@bubblebeadfilters.co.uk

WATER GARDEN GEMS, Texas
Tel: 210-659-5841 *(Fax: 210-659-1528)*
Email: USinfo@bubblebeadfilters.com

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BubbleBead Filters policy is one of constant development and improvement. Strict accuracy of illustrations is not guaranteed, especially with regard to ancillary fittings. Modification to design and materials may be necessary subsequent to publication.

If your filter was supplied with a serial number, please note it here:

Dealer Details: